

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### A Centring Device for Centring Conduits and the like in Bore Holes

We, BAKER OIL TOOLS, INC., a Corporation duly organized under the laws of the State of California, of 6000 South Boyle Avenue, Los Angeles, State of California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to centralisers for centring casing, liners, and similar conduits in well bores.

It is an object of the present invention to provide a simple, sturdy, and comparatively inexpensive casing centraliser, which can be pulled through the well bore upon movement of the casing string therein in either longitudinal direction, and which permits rotation of the casing string without corresponding rotation of the centraliser itself.

According to the present invention there is provided a centring device for centring conduits and the like in well bores, including a pair of spaced cylindrical members having circularly spaced slots and circumferentially continuous inner ends facing each other with outwardly bowed spring members extending between said spaced cylindrical members and being endwise disposed over the inner ends of said members and extending into said slots whereat they are secured thereto, and stop means disposed between the inner ends of said members.

One particular embodiment of the present invention is shown in the drawings accompanying and forming part of the present specification. This form will now be described in detail; but it is to be understood that such detailed description should not be taken in a limiting sense, since the scope of the invention is defined by the appended claims.

Referring to the drawings:—

Figure 1 is a side elevation of a casing centraliser mounted upon a casing section disposed in a well bore;

Fig. 2 is an enlarged cross section, taken along the line 2—2 on Fig. 1; and

Fig. 3 is a partial, isometric exploded view of the centraliser.

The casing centraliser A is mounted upon a section of casing B forming part of a casing string, in order to centre the latter in a well bore C in which it is disposed. The centraliser includes longitudinally spaced upper and lower cylindrical collars 10, 11, to which a plurality of circularly spaced, outwardly bowed springs 12 are secured. These collars are slidably mounted upon the casing section B, in order to permit relative longitudinal and rotary movement to take place therebetween.

It is to be noted that each collar has a plurality of circularly spaced, longitudinally extending slots 13 corresponding in number and angular spacing to the leaf springs 12. The inner ends 14 of these slots are disposed inwardly of the inner end 15 of each collar, and their outer ends 16 are disposed inwardly of the outer end 17 of the collar. Accordingly, the inner ends 15 of the collars are circumferentially continuous and provide a smooth surface upon which other elements are not prone to catch or snag.

The ends 18 of the leaf springs 12 are disposed over the inner ends 15 of the collars, fitting within the slots 13, with the terminal portions 19 of the springs abutting the collar material at the outer ends 16 of the slots. Such terminal portions are firmly secured to the collar at the outer ends of the slots by welding material 20. A satisfactory weld can be performed in several different manners without substantially affecting the properties of the leaf springs 12. It has been found that an atomic hydrogen arc weld

integrates the ends 19 of the springs to the collars 10, 11 without failure of the welds 20 or of the centraliser parts themselves upon collapsing of the springs inwardly to their fullest extent against the casing section B.

For the purpose of moving the centraliser A through the well bore with the casing string B, a stop ring 21 is attached to the casing section between the upper and lower collars 10, 11. This ring may be split initially to facilitate its mounting on the casing section B between the collar members. Thereafter, it is secured to the casing section by depositing welding material 22 in holes 23 provided in the ring. In addition, if deemed necessary, the adjacent ring ends defining the split 24 may also be welded to one another and to the casing B.

Because of the location of the stop ring 21 between the upper and lower collars 10, 11, the casing centraliser will be pulled through the well bore regardless of the direction of longitudinal movement of the casing B therein. Downward movement of the casing engages the stop ring 21 with the inner circumferentially continuous portion 15 of the lower collar 11, exerting a pulling action on the outwardly bowed springs 12. Similarly, upward movement of the casing string engages the stop ring 21 with the circumferentially continuous inner portion 15 of the upper collar 10, and causes an upward pulling action to be exerted on the outwardly bowed springs 12. Full bearing engagement of the stop ring 21 with either collar is assured because of the circumferential continuity of the inner ends 15 of the collars and the fact that the bowed springs 12 are disposed over the exterior of such circumferentially continuous portions. As a result, the springs do not interfere with engagement of the ring with the collars. Of course, to avoid such interference, the external diameter of the stop ring 21 is preferably no greater than the external diameter of the collars themselves.

In addition to ensuring the pulling of the centraliser through the well bore as distinguished from its being pushed through the well bore, the casing string B may be rotated freely within the upper and lower collars 10, 11 of the centraliser. This is evident, since there is no connection whatsoever between the casing and the collars. The stop ring 21 will either be disposed out of engagement with both collars 10, 11 so as not to interfere with the free rotation of the casing within the

collars, or it may actually be engaged with either collar and will still allow the casing to be freely rotated within the collar, since the stop ring merely rides along the circumferentially continuous inner end 15 of the collar.

The inability of the casing string B to rotate the casing centraliser A ensures the ability of the casing string to rotate freely, and also ensures against the necessity for dragging the centraliser springs 12 around the walls of the formation, which might produce their breakage.

It is apparent that the centraliser is relatively simple and compact, in view of its comparatively few parts. Its overall maximum diameter, when the springs 12 are in fully collapsed condition against the casing, is the outside diameter of a collar 10 or 11, plus twice the thickness of a centraliser spring. This small overall diameter permits the centraliser to be moved through other casing sections and through well bores whose internal diameters are only slightly greater than the external diameter of the casing on which the centraliser is mounted. In addition, the collapsed external diameter of the centraliser is very little, if any greater than the external diameter of the usual casing collars which couple the casing sections together.

What we claim is:—

1. A centring device for centring conduits and the like in well bores, including a pair of spaced cylindrical members having circularly spaced slots and circumferentially continuous inner ends facing each other with outwardly bowed spring members extending between said spaced cylindrical members and being endwise disposed over the inner ends of said members and extending into said slots whereat they are secured thereto, and stop means disposed between the inner ends of said members.

2. A centring device as set forth in Claim 1, in which said spring ends are weldingly secured to said members at the outer ends of said slots.

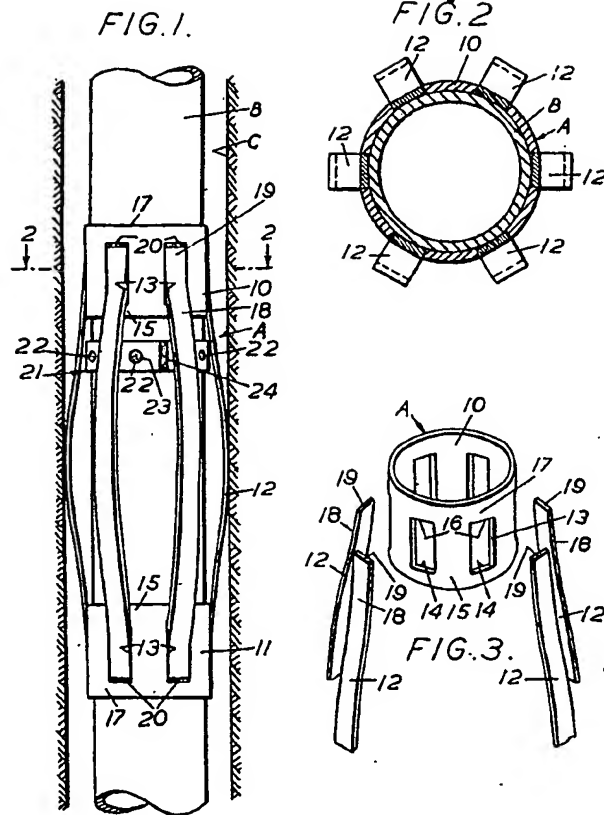
3. A centring device as set forth in Claim 2, in which said members are slidable on said well conduit and said stop ring is secured to the conduit between said members for selective engagement with the circumferentially continuous inner ends of said members.

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1 SHEET

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